Impact of donors aged 60 years or more on outcome after lung transplantation: Results of an 11-year single-center experience

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Objective: We examined the outcome of lung transplantation with the use of donors aged 60 years or more.

Methods: From May 1994 to May 2005, 467 lung transplants were performed at our institution. A total of 60 recipients received lungs from donors aged 60 years or more (range 60–77 years, median 65 years), whereas 407 recipients received lungs from younger donors (range 9–59, median 39 years).

Results: A total of 48 patients (10%) died within 30 days of surgery: 10 (17%) in the older donor group versus 38 (9%) in the younger donor group ($P = .08$). The operative mortality varied with the underlying lung disease and was higher in recipients presenting with pulmonary hypertension and pulmonary fibrosis than with emphysema or cystic fibrosis. A total of 210 patients died after a median follow-up of 25 months (range 0–136 months). The overall 5- and 10-year survivals were 57% and 38%, respectively. However, the 10-year survival tended to be worse in the older donor group (16% vs 39% in the younger donor group, $P = .07$). Bronchiolitis obliterans syndrome was the predominant cause of death in recipients of older donors who survived for more than 90 days after surgery (11/17, 65% vs 45/132, 34% in recipients of younger donors surviving for >90 days after surgery, $P = .01$).

Conclusions: Given the lack of organ donors, lungs from donors aged 60 years or more should be considered for transplantation. However, the use of donors aged 60 years or more is associated with a lower 10-year survival, and bronchiolitis obliterans syndrome plays a significant role as the cause of late death.

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Lung transplantation has had increasing success and has become the mainstay of therapy for most end-stage lung diseases. The Registry of the International Society for Heart and Lung Transplantation reported in 2005 that more than 15,000 lung transplants have been performed worldwide, and approximately 1500 lung transplants are performed annually.[1] During the past 15 years, the number of recipients on the waiting list has been progressively increasing and now far exceeds the number of organs available. Consequently, the median waiting time for lung transplantation has nearly doubled in North America and Europe, and 20% to 30% of the patients awaiting lung transplantation are currently dying.[2]

Abbreviation and Acronym
BOS = bronchiolitis obliterans syndrome

A number of strategies have been advocated to increase the number of donors. Some centers have developed a living-related lung donor program, whereas others have focused on non–heart beating donors to ultimately palliate the lack of donors. Although living-related donors have been used successfully[3] and non–heart beating donors have been shown to be feasible in humans,[4] these strategies have remained limited to a small number of patients because of technical, medical, and ethical considerations.

The persistent shortage of lung donors has led to increasing interest in reevaluating the existing lung donor pool. Over the years, improvement in donor management and refinement in techniques of lung preservation have allowed expansion of some of the donor selection criteria without significant impact on the early morbidity and mortality after lung transplantation.[5-8] However, despite the increasing use of marginal or extended donor lungs, extension of the selection criteria to donors aged 60 years or more is still considered as a contraindication for lung transplantation by the large majority of centers, and many lung donors are currently refused on the basis of age only. During the last several years, we have adopted a policy to not disqualify donors solely on the basis of age but to consider the lungs for transplantation if they fulfill other selection criteria. In this report, we analyzed the results from a series of 60 consecutive donors aged 60 years or more who were used for lung transplantation at our institution. The early and late outcomes were then compared with the group of recipients with transplants from donors aged less than 60 years at our institution during the same period.

Materials and Methods

Between May 1994 and May 2005, 467 patients underwent lung transplantation at our institution. A total of 60 patients (12.8%) received lungs from donors aged 60 years or more during this time period. Data for these 60 patients were retrospectively collected after the study was approved by our institutional review board. Donor information included gender, smoking history, oxygenation on 100% inspired fraction of oxygen, duration of intubation, cause of death, bronchoscopy findings, chest radiography abnormality, type of lung preservation, and ischemic time. The early and long-term outcomes for this group of patients (older donor group) were then compared with the group of 407 recipients who underwent transplantation at our institution during the same period but received lungs from donors aged less than 60 years (younger donor group). Recipient information included age, gender, diagnosis, type of lung transplant, and cause of death. Cause of death was assigned independently at our mortality review and prospectively collected in the database. Follow-up was complete for all patients until May 2005.

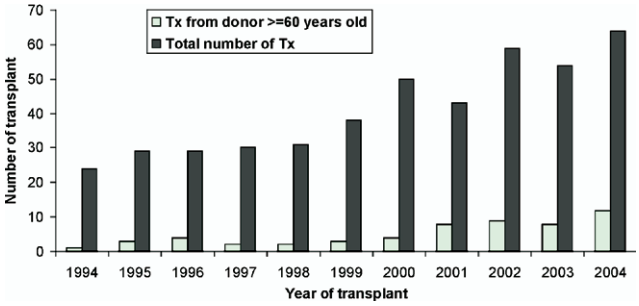

Figure 1. Proportion of transplants performed with donors aged 60 years or more at our institution between 1994 and 2004. *Tx*, Transplant.

Donor management has been reviewed in detail elsewhere.[9] Briefly, all donors received intravenous methylprednisolone (15 mg/kg; Solu-Medrol, Upjohn, Don Mills, Ontario, Canada) after brain death declaration. Donors were maintained euvolemic to avoid excess fluid administration, and vasopressin was often used to maintain adequate blood pressure. The use of Euro-Collins (Fresenius, Lexington, Mass) was switched to low-potassium dextran solution (Perfadex; Vitrolife, Goteborg, Sweden) for lung preservation in April 1998. Only truly purulent secretions in distal airways were considered as abnormal on bronchoscopy. Chest radiography was considered abnormal in the presence of pulmonary contusion or infiltrates. The last P_{AO_2} was measured in the operating room after donor resuscitation and management by the retrieval team.

Surgical procedure, immunosuppression, and antibiotic prophylaxis have also been reviewed in detail elsewhere.[10] Recipients were chosen by the transplant surgeon, on the basis of blood type, size match, recipient status, time on the waiting list, and recipient age. Single lung transplant was usually performed through a posterolateral thoracotomy. Bilateral lung transplant and heart–lung transplant were performed through a clamshell incision.

Data are expressed as means ± standard deviation or as median and range. The Student *t* test was used to test differences between continuous variables, and the chi-square test was used for categoric variables. Multivariate analysis was performed by logistic regression analysis. Survival was calculated with the Kaplan–Meier method, and survival curves were compared using the log–rank test. Statview V (Abacus Concept, Berkeley, Calif) was used for all analyses.

Results

The number of donors aged 60 years or more, according to the number of lung transplantations performed every year at our institution, is shown in Figure 1. The number of older donors progressively increased over time, and currently approximate 15% to 20% of the lung transplants that are performed yearly at our institution.

The majority of older donors presented with no smoking history, no purulent secretions in distal airways, a short intubation time, and normal chest radiography (Table 1).

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Table 1. Characteristics of donors aged 60 years and older

Age (years)	
Median	65
Range	60-77
Gender (n)	
Female	29
Male	31
Cause of death (n)	
Trauma	7
Other	53
Smoking history (n)	
No	34
≤20 pack-year	10
>20 pack-year	14
Unknown	2
Duration of intubation (hours)	
Median	27
Range	12-96
Bronchoscopy findings (n)	
Pus in airways	2
No pus in airways	58
Chest x-ray (n)	
Normal	44
Abnormal	16
Best PaO_2 (mmHg)	
Median	449
Range	282-592

Table 2. Recipient and surgical characteristics

	Older donors (n = 60)	Younger donors (n = 407)	*P*-value
Age (years)	49 ± 15	45 ± 15	0.05
Gender			0.07
Female	35 (58%)	187 (46%)	
Male	25 (42%)	220 (54%)	
Diagnosis			0.6
Pulmonary fibrosis	17 (28%)	105 (26%)	
Emphysema	15 (25%)	114 (28%)	
Cystic fibrosis	13 (22%)	97 (24%)	
Bronchiectasis	4 (7%)	11 (2%)	
Pulmonary hypertension	2 (3%)	44 (11%)	
Sarcoidosis	2 (3%)	9 (2%)	
Re-transplant	2 (3%)	5 (1%)	
Other	5 (9%)	22 (6%)	
Type of transplant			0.3
Bilateral lung	55 (92%)	349 (86%)	
Single lung	5 (8%)	45 (11%)	
Heart-lung	0	13 (3%)	
Preservation solution			0.2
Perfadex	50 (83%)	312 (77%)	
Euro-Collins	10 (17%)	95 (23%)	
Total ischemic time (min)			0.9
First lung	247 ± 91	258 ± 104	
Second lung	358 ± 103	361 ± 105	
Cardiopulmonary bypass	18 (30%)	167 (41%)	0.1

The cause of death was mainly intracranial bleeding and was rarely secondary to trauma. A total of 24 donors had a smoking history. The smoking history was 20 pack-years or less in 10 donors and ranged between 30 and 75 pack-years in 14 donors. Nine donors presented with a P_{AO_2} of less than 300 mm Hg during the initial management, but only 2 donors had a P_{AO_2} that remained less than 300 mm Hg after aggressive donor resuscitation.

Recipient and surgical characteristics were similar between those receiving lungs from donors aged 60 years or more and those receiving lungs from donors aged less than 60 years (Table 2). However, more women received lungs from older donors, and the mean recipient age tended to be older in the older donor group. Forty-four of the 46 recipients who underwent transplantation for pulmonary hypertension (idiopathic pulmonary arterial hypertension and Eisenmenger's syndrome) received lungs from younger donors. The large majority of transplants were bilateral lung transplant in both older and younger donors. Older donors, however, were not used for heart–lung transplantation. The ischemic times were similar between the younger and older donor groups.

A total of 48 patients (10%) died within 30 days from transplantation: 10 (17%) in the older donor group versus 38 (9%) in the younger donor group ($P = .08$). Causes of death were primary graft dysfunction in 13 patients (3 in the older donor group vs 10 in the younger donor group, $P = .8$), sepsis in 19 patients (5 in the older donor group vs 14 in the younger donor group, $P = .6$), and cardiac complications in 8 patients (2 in the older donor group vs 6 in the younger donor group, $P = .8$). An additional 8 patients died of other causes in the younger donor group.

The 30-day mortality varied with the underlying lung disease and was significantly higher in recipients presenting with pulmonary fibrosis and pulmonary hypertension than in recipients presenting with cystic fibrosis or emphysema (Table 3). In recipients presenting with cystic fibrosis, the death rate was 8% in the older and younger donor groups, and in recipients presenting with emphysema, the death rate was 0% in the older donor group and 7% in the younger

Table 3. Postoperative (30-day) mortality according to recipient's diagnosis

	Older donors	Younger donors	*P*-value
Pulmonary fibrosis	5/17 (29%)	13/105 (12%)	0.06
Emphysema	0/15 (0%)	8/114 (7%)	0.3
Cystic fibrosis	1/13 (8%)	8/97 (8%)	0.9
Pulmonary hypertension	2/2 (100%)	8/44 (18%)	0.006
Re-transplant	1/2 (50%)	1/5 (20%)	0.6
Pulmonary hemosiderosis	1/1 (100%)	/	

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Table 4. Risk factors for 30-day mortality

Potential risk factors	*P*-value	95% CI
Transplantation performed for pulmonary fibrosis or pulmonary hypertension	0.001	1.5-5.1
Utilization of cardiopulmonary bypass	0.0003	1.7-6.1
Donor age ≥60 years old	0.09	0.9-4.1
Recipient age (≥60 years old vs <60 years old)	0.5	0.4-1.6
Type of lung transplant (bilateral vs single)	0.4	0.3-1.6
Preservation solution (Euro-Collins versus Perfadex)	0.7	0.6-2.3

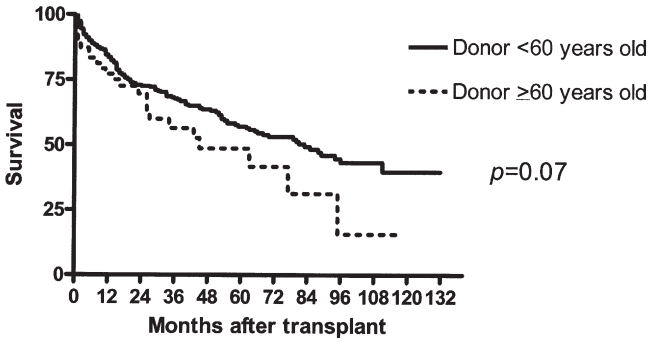

Figure 3. Cumulative overall posttransplant survival of recipients who received lung transplants from donors aged more than and less than 60 years.

donor group. In contrast, in the high-risk recipient group, the age of the donor seemed to be a significant risk factor. For pulmonary hypertension, both recipients of older donors died within 30 days of surgery, whereas in patients with pulmonary fibrosis, the 30-day mortality was 29% in the older donor group and 12% in the younger donor group.

Multivariate logistic regression analysis demonstrated that a diagnosis of pulmonary fibrosis or pulmonary hypertension and the use of cardiopulmonary bypass were associated with a significantly greater risk of death within 30 days after lung transplantation (Table 4). Although the risk of death within 30 days tended to be increased in recipients of donors aged 60 years and older, it did not reach statistical significance. Other factors, such as recipient age, type of transplant, and preservation solution, did not affect the 30-day mortality.

A total of 210 patients died after a median follow-up of 25 months (range 0-136 months). The overall 5- and 10-year cumulative survivals were 57% and 38%, respectively (Figure 2). However, the 10-year survival tended to be worse in the older donor group (16% vs 39% in the younger donor group, $P = .07$) (Figure 3). The long-term survival was not influenced by recipient gender (male vs female, $P = .5$), recipient age (<60 years vs ≥ 60 years, $P = .3$), or type of transplant (single vs bilateral, $P = .7$). The long-term survival was not significantly different between patients who underwent transplantation for emphysema (38% at 10 years), cystic fibrosis (34% at 10 years), pulmonary fibrosis (38% at 10 years), or pulmonary hypertension (55% at 10 years) ($P = .4$).

The causes of death were primarily bronchiolitis obliterans syndrome (BOS) and sepsis among recipients who survived for more than 90 days posttransplantation (Table 5). A total of 56 patients died of BOS, and 54 patients died of sepsis. BOS was the predominant cause of death in recipients of the older donor group who survived for more than 90 days after surgery, whereas sepsis was the predominant cause of death in recipients of the younger donor group who survived for more than 90 days after surgery. A total of 11 patients (65%) died of BOS in the older donor group, whereas 45 patients (34%) died of BOS in the younger donor group ($P = .01$). The other causes of death were not significantly different between the 2 groups.

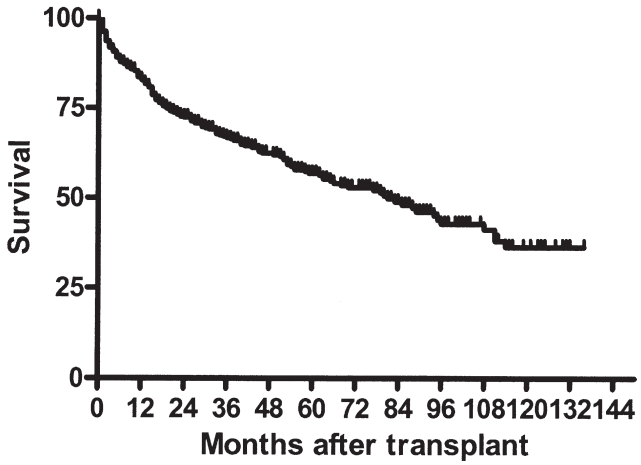

Figure 2. Cumulative overall survival for all 467 recipients.

Table 5. Causes of death in recipients who died more than 90 days after their transplant

	Older donors (n = 17)	Younger donors (n = 132)	*P*-value
Bronchiolitis obliterans syndrome	11	45	0.01
Sepsis	4	50	0.3
Severe acute rejection	0	2	0.6
Cancer	0	10	0.2
Cardiac complications	0	2	0.6
Neurologic complications	1	3	0.4
Other	1	20	0.3

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A total of 10 recipients received lungs from donors aged 70 years or more (median age 73 years, range 70-77 years). Recipient diagnoses were pulmonary fibrosis (n = 4), emphysema (n = 2), cystic fibrosis (n = 2), sarcoidosis (n = 1), and idiopathic pulmonary hemosiderosis (n = 1). All patients underwent bilateral lung transplantation. One patient died of primary graft dysfunction within 30 days of surgery, 1 patient died of sepsis 6 weeks after surgery, and 1 patient died of BOS 16 months after surgery. Seven patients are alive 6 to 82 months after transplantation with a cumulative 5-year survival of 60%.

Discussion

The constantly increasing number of patients awaiting lung transplantation has led to a critical shortage of lung donors. Therefore, over the past few years, lung donor selection criteria have been progressively liberalized. Donors with prolonged intubation, significant smoking history, history of asthma, or abnormal chest radiography have been used for transplantation without significant impact on the early postoperative outcome.[6,7] Although donors aged more than 55 years represent a large group of potentially available donors, most programs have remained skeptical about using older donors for lung transplantation. Some reports mentioned the use of occasional donors aged more than 55 years, but the number has remained small and has generally been limited to donors aged less than 60 years.[6-8]

During the last few years, we have taken the policy to consider all donors for lung transplantation and to avoid disqualifying donors on the basis of age only. This study was performed to review our experience with the first 60 consecutive donors aged 60 years or more whom we have used for lung transplantation in our program. Most of the older donors were nonsmokers, were intubated for less than 2 days, and presented with normal bronchoscopy and normal chest radiography. However, with increasing experience, we have become less restrictive and occasionally accepted older donors with a history of smoking, abnormal chest radiography, or a P_{AO_2} less than 300 mm Hg.

To evaluate the impact of older donors on early and late outcome after lung transplantation, we have used for comparison the group of 407 consecutive recipients receiving lungs from donors aged less than 60 years during the same time period at our institution. When comparing the 2 groups, we observed that the 30-day postoperative mortality was increased when older donors were used in recipients who underwent transplantation for pulmonary fibrosis and pulmonary hypertension. In contrast, only 1 patient who underwent transplantation for cystic fibrosis and no patient who underwent transplantation for emphysema died within 30 days of transplant in the older donor group. Thus, these findings suggest that older donors can be safely used in low-risk recipients. In high-risk recipients (eg, those with pulmonary hypertension or pulmonary fibrosis), however, the use of older donors should be carefully evaluated.

Evaluation of the operative risk should be determined by the quality of the donor, length of ischemic time, and recipient risk factors.[11-13] An analysis from the United Network for Organ Sharing database showed that the interaction of older donor age and prolonged ischemic time was associated with increasing mortality at 1 month and at 1 year after lung transplantation.[14] Although this study had only 23 donors aged more than 55 years, it is interesting to see that the postoperative mortality rate exponentially increased in donors aged more than 55 years when the ischemic time was more than 7 to 8 hours. In our experience, the total ischemic time for the second lung was less than 8 hours in all but 4 recipients with donors aged 60 years or more. It must be noted, however, that lung preservation has improved over the years and that the ischemic time seems to have less importance because the use of Euro-Collins was switched to Perfadex.[9]

The long-term outcome after lung transplantation can be influenced by donor lung characteristics. Ciccone and colleagues[15] showed that recipients of donors with traumatic brain death experienced more severe rejection episodes during the first year posttransplantation and were predisposed to earlier development of BOS. In our experience, recipients of donors aged 60 years or more had lower 5- and 10-year survivals than recipients of younger donors. In addition, the cause of death was predominantly BOS in the older donor group, whereas it was predominantly sepsis in the younger donor group. Lower survival at 5 years after transplantation has also been observed in kidney and liver recipients who received their organs from donors aged more than 60 years.[16,17] Thus, considering the total burden of injury that the transplanted organ is expected to endure, not unexpectedly, the use of older donors is associated with lower long-term survival. However, given the current lack of organ donors, lungs transplanted from donors aged 60 years or more can save the lives of many patients who would otherwise be at risk of dying of end-stage lung disease while on the waiting list.

The proportion of cadaveric donors aged 60 years or more has been progressively increasing over the past decade and now exceeds 10% of all cadaveric donors available for transplantation.[18,19] In Canada, the rate of cadaveric donors aged 60 years or more has increased from 6% in 1992 to 15% or more in 1998 and thereafter.[19] Thus, liberalization of the age as criteria for lung donation could significantly expand the number of organs available. In our experience, the proportion of donors aged 60 years or more has varied between 15% and 20% of all lung transplantations performed since 2001 at our institution. These organs have been mainly allocated to older recipients and the most ill patients on the waiting list.

Conclusions

This study demonstrates that lungs from older donors could be considered for transplantation if they fulfill all other lung donor selection criteria. An evaluation of the postoperative risk should, however, be performed on the basis of donor characteristics and recipient diagnosis. Recipients with pulmonary fibrosis or pulmonary hypertension certainly present higher-risk recipients in whom older donors should be used cautiously. Although donor age can affect long-term survival posttransplantation, given the current shortage of organs, older donors should be considered for lung transplantation and not be discarded on the basis of age only.

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Discussion

Dr J. Wain *(Boston, Massachusetts).* I thank the Society for the opportunity to discuss the article and congratulate Dr De Perrot and the Toronto group on an impressive experience and a timely presentation for us about lung transplantation. The issue of a limited supply of donors for lung transplantation is truly critical at the present time, and the group here is certainly to be congratulated for the courage to take donors in increasing numbers, both 60 and 70 years of age or older, as well as the forthright presentation of the results in using these donors themselves. I think the general conclusion of the study, that donors more than 60 years of age can provide acceptable organs for lung transplantation in selected circumstances, is sound and valid. The results of the study certainly underscore the paradigm that, short of active malignancy, no one single demographic or physiologic characteristic should rule out a potential lung donor candidate, and clearly age should be thrown out based on this experience. I have 4 questions. First, the time course of the study, 1994 to 2005—did you use any older donors before 1994? Was that the first year that you began using those donors?

Dr De Perrot. Yes, 1994 was the first year a donor older than 60 years was used in our experience.

Dr Wain. Great. That's what I presumed was probably the case, because you can clearly see from the graph that you were using more and more of the donors over time.

Second, why do you think it is that the older donors don't do as well in recipients with a diagnosis of pulmonary fibrosis or pulmonary hypertension? Do you think there is intrinsic disease in those donor lungs that is not identified, or is there some other factor?

Dr De Perrot. I think the older donors don't have the same potential to sustain postoperative complications as younger donors do. One question that we are starting to look at is pulmonary hypertension. We are trying to determine whether the patient with pulmonary fibrosis who died with older lungs had high pulmonary artery pressures at the time of surgery or not, but I don't have the data yet.

Dr Wain. Well, that would certainly make sense, and from that perspective, are there any other studies one can do on these older donors before procurement, such as a computed tomography scan or angiographic imaging, that might help you to select them better?

Dr De Perrot. We haven't done any of that. It's always potentially a problem to have underlying lung disease that you don't detect at the time of retrieval. The risk is higher in older donors but can be encountered in younger donors too. What we have done in addition to our standard evaluation is more routinely measure the pulmonary artery pressures in the donor. Certainly this series of donors, in addition to the age, have been very good donors. So the older they get, the more strict we are with the criteria other than age.

Dr Wain. I see. The last question, really to help guide the rest of us if we're not quite as brave as you are, is how would you describe the ideal recipient for a set of lungs from a donor aged more than 60 years, and perhaps more important, who would you say absolutely should never get a set of donor lungs from someone aged more than 60 years?

Dr De Perrot. I would be very cautious about using older lungs for patients with pulmonary hypertension, but it really comes down to how sick the recipients are on the waiting list. These lungs have been used for recipients who were very sick and would not have survived for long without a transplant.

Dr Wain. The recipient age, for instance, wouldn't be something that you would look at critically?

Dr De Perrot. We would rather put old lungs into an old recipient, but if you have somebody who is young and very sick on the waiting list, we would use these lungs as well.

Dr J. Sonett *(New York, New York)*. So you would use a 62-year-old lung in a 20-year-old with cystic fibrosis even with the questionable increased BOS rate?

Dr De Perrot. Yes. If the recipient is clearly sick, for instance, with high CO_2 or in the hospital on biphasic positive airway pressure, we would use these lungs.

Dr Wain. I congratulate you on this study, and I want to hear more about it in a couple of years and see how things continue to turn out.

Dr S. Keshavjee *(Toronto, Ontario, Canada)*. I know Marc mentioned measuring pulmonary artery pressures, and if your donor doesn't have a Swan, one should at least check it with a pressure line, because we have turned down some older donors in whom we found significant pulmonary hypertension at the time of organ retrieval. Furthermore, it is important to note that when you look at our experience of the mortalities in those with idiopathic pulmonary fibrosis and primary pulmonary hypertension with an old donor, it's often that clinical situation in which you have a recipient who is desperately ill and you stick your neck out thinking, well, this is going to be their last chance, and yes, it's risky, but they don't really have another opportunity; however, when you look back at your data you inevitably see increased mortality in the high-risk recipients, such as those with pulmonary hypertension. So when Dr Wain asked the question of who absolutely shouldn't get it, one needs to examine this in the context of the fact that often when we do that, it's in extenuating clinical circumstances, of compounding risks, using a high-risk donor for a high-risk recipient.

Dr Y. Toyoda *(Pittsburgh, Pennsylvania)*. I have a similar question. We performed 91 lung transplants last year. Of these, about 10% had donors aged 60 years or more. So we are very comfortable with the donor age up to 65 years now, but beyond 65 years, we try to use donors locally. We use older donors for older recipients. Is your conclusion that older donors provide a worse outcome perhaps related to the older recipient population?

Dr De Perrot. Using older donors for older recipients can provide a worse outcome?

Dr Toyoda. Yes, worse survival.

Dr De Perrot. The recipient age doesn't seem to be a factor that will lead to more complications. Recipients with pulmonary fibrosis are usually older, but the recipient age in itself, in our experience at least, didn't seem to make a difference in the recovery from the surgery.

Dr P. Theodore *(San Francisco, California)*. Marc, thank you for that lucid presentation. We have been impressed, and your data seem similar in a lot of the ischemia-reperfusion injury that we see in older donors, and I noticed in those patients who died, it looked like upward of 30% had primary graft dysfunction. I have often wondered if the older donors are less tolerant of periods of cold ischemia and if you have any correlation at all in terms of the period of ischemia and the outcomes related to older donors, specifically because their endothelial function may be somewhat different as to the donor's age, and they may be more sensitive to those periods of ischemia.

Dr De Perrot. There are data from the International Society for Heart and Lung Transplantation that I'm sure you are aware of: They observed that the age of the donor and the ischemic time had a negative cumulative impact on outcome. But all these data were published several years ago, and I think the quality of the lung preservation has improved since then. The use of Perfadex and other improvements in the preservation technique have probably helped to reduce the risk of prolonged ischemic times. In this series of transplants, most of the ischemic times were somewhere between 6 and 8 hours. There were 4 patients who received older lungs with an ischemic time longer than 8 hours, and they have been doing well. I think the ischemic time doesn't have so much of an impact. I think it's really more donor and recipient parameters that will affect the outcome.

Dr S. Yang *(Baltimore, Maryland)*. If I could go back to the first article. In your data is there any way to answer some of these other questions about the older donor for the older patients? Were you able to see any trends?

Dr Nwakanma. We did not pay attention to that. It can be done.

Dr Yang. It can be done.

Dr Nwakanma. Yes.

Dr Yang. That's for next year's talk.